

2. On the Ornis of the State of São Paulo, Brazil.

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(Plate XXVII.)

Since my paper "As aves do Estado do São Paulo" (*Revista do Museu Paulista*, vol. iii. São Paulo, 1898, pp. 113-476) is written in Portuguese, I believe it may be useful to offer to the Zoological Society of London an account of the general results at which I have arrived on this subject.

The studies made by me during the past six years on the Ornis of this State have led to conclusions concerning the geographical distribution of its Birds which differ essentially from those published by Pelzeln in his work on the Birds collected by Natterer. It is necessary to distinguish between the material results due to the efforts of Natterer, the most successful of all those who have ever collected in South America, and the generalizations on geographical provinces based by Pelzeln on Natterer's collections, which seem to me to be unsatisfactory. It is true that with reference to São Paulo, Pelzeln has noted the extension of the Minas and Matto-Grosso faunistic element into this State, but he has established artificial zoo-geographical boundaries, and has not noticed those really existing.

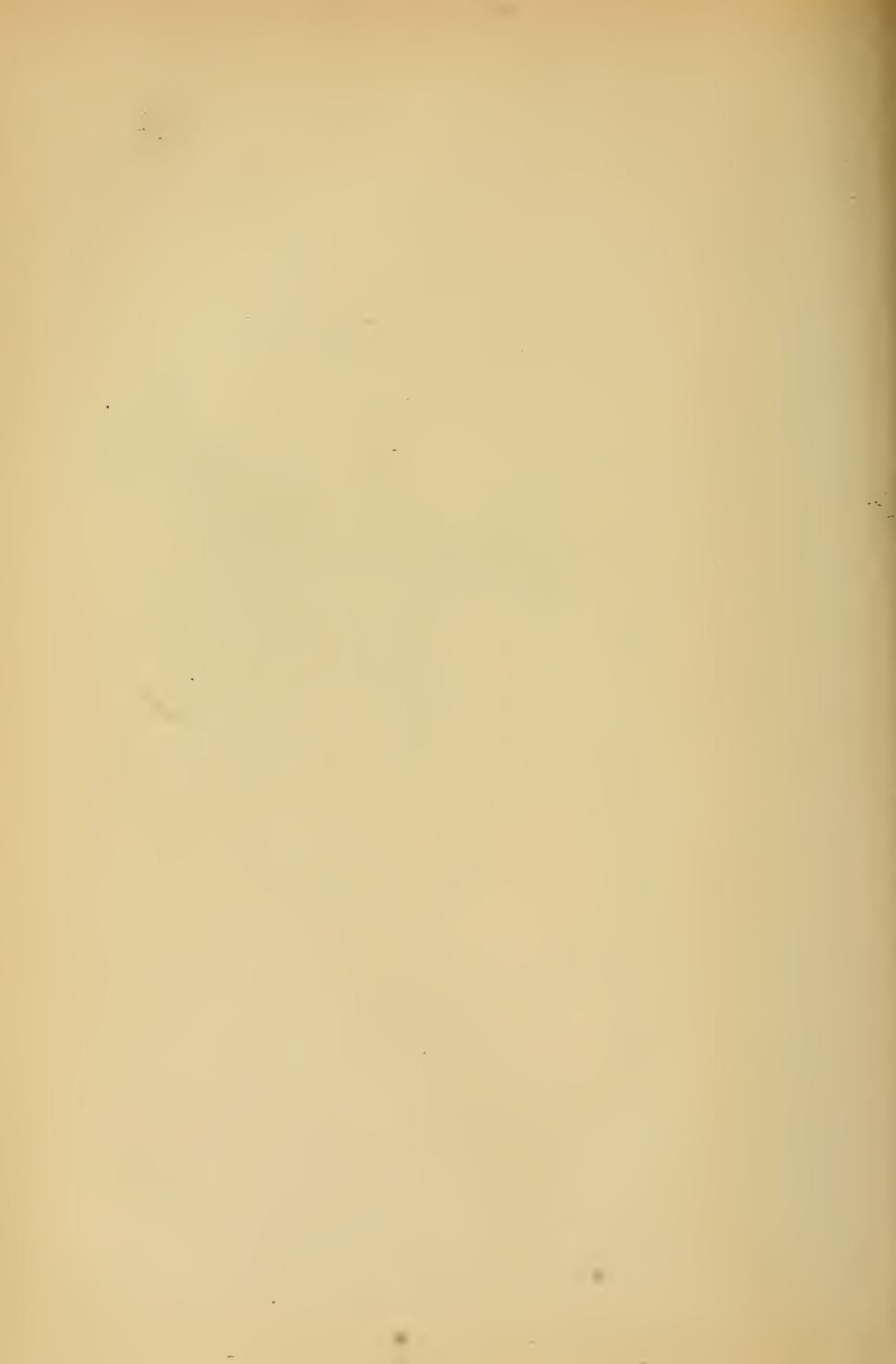
I do not wish to be understood as in any way underestimating Pelzeln's valuable memoir, but Science progresses and often modifies previous results. The work of Pelzeln was based essentially upon the collections of Natterer; and Natterer travelled neither in the States of Sta. Catharina and Rio Grande do Sul, nor in the littoral zone between Rio and Pará. The lists given by Pelzeln have been greatly modified and augmented by my paper above referred to and by other recent publications; and the marked differences between the highland and the coastal lowland of São Paulo were not noticed by Natterer and Pelzeln.

There is another reason for the differences between Pelzeln and myself. Pelzeln used a statistical method to define the different regions which he created, by compiling lists of the birds found in one, two, or more of his regions. I believe that accurate material is not yet available for this kind of work. This method is that of abstractions and generalizations, as used by Wallace, Selater, and other great masters of Zoo-geography. But besides this method we can use another, that of studying analytically the different elements of the fauna of a restricted area and discovering its zoo-geographical boundary-lines. This course I have taken in studying the fauna of Rio Grande do Sul, thus verifying the different zoo-geographical boundaries; and a similar result has been obtained from my studies on the fauna of São Paulo. These boundaries are of secondary importance, marking natural divisions in the greater Zoo-geographical Provinces: as, however, they are not artificial but natural boundaries, it is important to discover them.



ORNIS OF THE STATE OF SÃO PAULO, BRAZIL.

F.S. Waller, F.R.G.S.



Evidence of this is given by the fact that Pelzeln has not mentioned the line which coincides with the boundary between the States of Paraná and São Paulo. Although some of the more striking pieces of evidence of this line have been given only in my paper, others are due to Natterer's collections. This line marks the northern limits of a number of Argentine species which occur in the three southernmost States of Brazil, but do not extend north of it into São Paulo and Rio. Besides certain characteristic species, such genera as *Cyanotis*, *Phlæocryptes*, *Anumbius*, *Clibanornis* and *Haplospiza* characterize this "*Anumbius*-line," as it may be named.

I cannot forbear to mention that I have been astonished to find that such results as those I have arrived at on the faunistic boundary-lines in Rio Grande do Sul should have been disregarded by zoologists. However, I shall continue to work on in the same manner, and if with this help there cannot be constructed a complete system, we shall obtain at any rate exact data for the analysis of the faunas of some of the States; and if the same task be undertaken in other States of Brazil, the results must without doubt be satisfactory—as a piece of mosaic-work, but a definite one. It is evident that such work can only be the result of extensive and exact explorations of restricted areas, and more of it is to be expected from Museums than from observers, who spend but a short time in one country. I hope that Dr. Goeldi, continuing his work in the Pará Museum, will investigate the State of Pará in the same manner.

In concluding these general remarks, I wish to state, as the result of my studies, that South-eastern Brazil, from Rio Grande do Sul to Bahia, and probably farther northward, forms a natural province of the Neotropical Region, which contains two Subdivisions (see Map, Plate XXVII.). One of these extends from Rio Grande do Sul to Rio de Janeiro; the other from the North down to São Paulo. The northern Subdivision extends along the coast of São Paulo to Iguape and probably farther southward, but is here restricted to a narrow coast-zone. This is separated by a narrow chain of mountains from the highlands, and these highlands towards the west pass into campos, which have the same fauna as the campos of Minas, Goyaz, and Matto Grosso. We have, therefore, in São Paulo three faunistic subdivisions, representing from the west to the coast successively the central, marginal, and littoral fauna. The two last are separated by the Serra do Mar, which is only a few miles broad, but supplies a difference of altitude of more than 700 mètres and a difference of temperature of 3° C. or more. This is the reason why many Bahia species which do not occur in the interior of São Paulo are found along the coast.

I now proceed to the special discussion of my paper and its zoo-geographical results.

There are two new species described in my paper—*Chrysotis schmidti*, closely allied to *Ch. auripalliata*, but with the bend of

the wing green instead of red; and *Crax sulcirostris*, with a large sulcus descending longitudinally on each side of the beak. Both are apparently from near the mouth of the Tieté River. Colonel C. Schmidt, of Rio Claro, has informed me that the *Chrysotis* is common in that part of the Tieté, and is called "*Papagaio inglês*." I have described the two species in order to call attention to them. I have sent some other specimens which may belong to new species to the British Museum and Count Berlepsch. That in a fauna of nearly 600 species so few only are new to science shows how much work has already been done on the Ornithology of South-eastern Brazil. Besides the two new species, the following are restricted to the province of São Paulo, if I am correctly informed:—

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|---------------------------------------------|-------------------------------------------|
| 1. <i>Basileuterus leucophrys</i> Pelz. | 5. <i>Eucephala cœruleo-lavata</i> Gould. |
| 2. <i>Spermophila melanogaster</i> Pelz. | 6. <i>Plochoptera iolema</i> (Reich.). |
| 3. <i>Hapalocercus rufomarginatus</i> Pelz. | 7. <i>Astur poliogaster</i> (Temm.). |
| 4. <i>Anabazenops amaurotis</i> (Temm.). | 8. <i>Stenopsis platura</i> Pelz. |

These seem to be essentially species of the Western Zone of the State, where we have hitherto made no collections, and this may be the reason why I have not yet obtained these rare forms, with the exception of the *Stenopsis*. Of this species Natterer collected only the female, and as my specimen is a male, the question whether this is a good species has been decided in favour of Natterer. Possibly one or more of these species may be recognized as having been previously described; as may also be the case with *Astur poliogaster*.

Then there is a series of other species which seem to occur only in São Paulo and Rio de Janeiro; such as *Ceratotriccus furcatus* (Lafr.), *Pogonotriccus eximius* (Temm.), *Elainea caniceps* (Sw.), *Lathria virussu* Pelz., *Biatas nigropectus* (Lafr.), *Cephalolepis delalandii* (Vieill.), and *Macropsalis creagra* (Bp.). It is very probable that all these species have really a wider distribution, as statements of their occurrence may have been overlooked by me. It is also to be presumed that, with the progress of the ornithological explorations of Brazil, they may be found in some of the adjoining States.

In contrast to these species of restricted occurrence, there are very many others of wide distribution in our Avifauna.

Of the species enumerated in my list, ninety-three occur all through Brazil, from its southern boundary to Pará, sixty-eight in Brazil and in other parts of South America, twenty-nine in South and North America, and eight are of an almost cosmopolitan distribution. These eight are *Strix flammea*, *Nycticorax nycticorax naevius*, *Arenaria interpres*, *Charadrius dominicus*, *Gelochelidon anglica*, *Sterna maxima*, *Oceanites oceanicus*, and *Majaqueus equinoctialis*. Altogether there are 198 species of wide distribution; that is, about one-third of all the species occurring in São Paulo. The number of widely dispersed species is very different in the various orders. If the two species of *Ceophlœus* ought to be united into one, there is no species of the order *Pici* occurring throughout

the whole of Brazil. On the contrary, in the orders *Steganopodes* and *Limicola*, all the species enumerated are of very wide distribution, there being very few of the occurrence of which, in Sta. Catharina and Rio Grande do Sul, I am uncertain, namely *Anhinga anhinga*, *Tringoides macularius*, and *Hoploxypterus cayanus*. The proportion of widely distributed species of birds which occur in São Paulo may be readily seen from the following estimated percentage:—*Pici*, 0 per cent.; *Clamatores*, 15 per cent.; *Psittaci*, 20 per cent.; *Oscines*, 24 per cent.; *Accipitres*, 63 per cent.; *Striges*, 80 per cent.; *Steganopodes* and *Limicola*, 100 per cent. It is quite evident therefore that, for the discussion of geographical distribution, the value of the different orders is quite unequal, and that most of them have little, if any, importance as regards our knowledge of the Zoo-geographical Provinces of Brazil.

The difficulty of the study of the different zoo-geographical zones which are distinguishable in the State of São Paulo, is due to the fact that we have not only to separate northern and southern elements, but also western, which represent the fauna of Goyaz and Minas advancing beyond its borders. Pelzeln first noted this fact, but his demarcating lines are merely imaginary and without sufficient foundation.

The number of species belonging to this Central Fauna in São Paulo is estimated by me as about seventy. I may mention as some of its characteristic species:—*Rhamphocelus jacapa*, *Tachyphonus melaleucus*, *Icterus pyrrhopterus*, *Nemosia pileata* and *N. guira*, *Brotogeris chiriri*, *Thalurania eriphile*, *Stenopsis candicans*, and *Nothura media*; and as typical genera, *Poliophtila*, *Agelæus*, *Icterus*, *Tiaris*, *Tenioptera*, *Muscipipa*, *Hapalocercus*, *Habrura*, *Piprites*, *Mctopia*, *Casiornis*, *Geobates*, *Herpsilochmus*, *Lepidolarina*, *Campylopterus*, *Eupetomena*, *Heliactin*, *Galbula*, *Brachygalba*, and *Taoniscus*.

I believe that we ought to add to this list the species of *Corvidæ*, the genera *Anadorhynchus* and *Ara*, and some species of *Chrysotis*, such as *C. castiva*. It seems that some of these western species are at the present time occupying parts of São Paulo, where they were not represented in the beginning of the present century; as I shall point out in the case of *Furnarius rufus*.

A great number of these species of the Central Fauna are birds of the campos; but it would be quite wrong to suppose that this is a universal feature, as in Goyaz and Matto-Grosso, as also in São Paulo, the Central Fauna includes both campos and forest birds. The last-named birds follow the River Paraná, and, in São Paulo, its confluent the rivers Tieté and Paranapanema.

The avifauna at the mouth of the Tieté River, at Itapura, is that of Matto-Grosso and Goyaz; and this fauna extends from Itapura to Avandava, at the mouth of the Rio Morto, and probably farther up. I have no personal experience of it, but I have received good information on the subject from intelligent Brazilian hunters.

The occurrence of such notable forms as *Ara chloroptera* and

A. ararauna, *Anadorhynchus hyacinthinus* and others, is of decisive importance, and the same Aras ascend the Paranapanema River a great distance up. I may observe, however, that I have sufficient knowledge of the birds of Tieté and Piracicaba, to say that the ornithology there is the same as that of São Paulo, without reference to differences of secondary importance.

We do not know the exact extension of the Goyaz elements along the Paranapanema River, but there are facts which make us believe that many tropical forms may have migrated along this river, definitely or temporarily, to the Ribeira River, and to the neighbourhood of Ypanema. It is quite possible that some tropical species, found by Natterer in 1820 at Ypanema, do not now live there, the character of the country having been greatly modified by culture. I was not able to obtain from the district of Ypanema species of *Holochilus* and other Rodents captured there by Natterer; but on the contrary there is now common there, as well as at São Paulo, *Hesperomys (Nectomys) sciureus* Wagn., which does not seem to be represented in the extensive collections made by Natterer. I believe that, as is the case with the *Furnarius*, this species has attained its present wide distribution in the State of São Paulo since the time of Natterer. *Furnarius rufus* is a species common in the campos of Rio Grande do Sul and Argentina, and occurs in São Paulo in the western regions, and in the valley of the Parahyba River. I am informed by Major Cornelio Vieira do Camargo that this bird made its appearance in the municipality of Tatuhy about twenty years ago. Natterer, in 1819-1822, obtained no specimens in the State of S. Paulo. In his list is registered a specimen from Rio, but erroneously; for Mr. Euler informs me that this bird does not occur in Rio de Janeiro at all. This species which, as we can hardly doubt, has in this country extended its area in a very remarkable manner into the State of São Paulo, occurs neither in the vicinity of the capital of the State nor in the littoral belt. It is therefore an element of the Central Fauna, immigrated into the intermediary zone; and it is a matter of further research to verify the other species which are in the same condition.

Poliophtila dumicola is an element of the Central Fauna which Natterer obtained on the Rio Paraná. It seems reasonable to suppose that the case of *P. leucogaster* would be the same, but as this species occurs also at Iguape, Rio, and Bahia, another explanation must be given.

Besides this central element, we have to distinguish species of São Paulo which are mainly found south of Rio and São Paulo, and others belonging to the Bahia-Rio district which in certain localities extend into the territory of São Paulo.

This southern element contains some species which extend from Buenos Ayres to Rio de Janeiro, such as *Stephanophorus cæruleus*, *Onipolegus cyanostris*, *Hemitriceus diops*, *Serphophaga nigricans*, and *Limnopardalis rhytirhynchus*. Besides these, there are others which occur from Argentina to São Paulo, as *Cistothorus polyglottus*, *Haplospiza unicolor*, *Coryphospiza albifrons*, *Serphophaga*

suberistata, *Culicivora stenura*, *Cyanotis azaræ*, *Anumbius acuticaudus*, *Furnarius rufus*, *Phlæocryptes melanops*, *Thamnophilus maculatus*, *T. ruficapillus*, *Ardea sibilatrix*, *Ardetta involucris*, *Plegadis guarana*, *Dafila spinicauda*, and *Fulica armillata*. There are also some marine or coast-birds which occur as temporary residents on the São Paulo coast, such as *Cygnus melanocoryphus* and *Spheniscus magellanicus*.

Of species occurring between Rio Grande do Sul and São Paulo, I may mention: *Calliste pretiosa*, *Cyanocorax cæruleus*, *Cybernetes yetaba*, *Thripophaga sclateri*, *Heliobletus contaminatus* Pelz. (= *superciliatus* Licht.), *Picolaptes falcinellus*, *Trogon surucura*, *Chrysotis brasiliensis*, and *Chrysotis pretrii*.

Some of the species that occur in São Paulo and Rio are known from Sta. Catharina, but I have no data to prove that they also occur in Rio Grande do Sul. Such are *Dacnis cayana* and *D. nigripes*, *Tanagra ornata* and *T. palmarum*, *Cissopis major*, *Cassida hæmorrhous*, *Cassidix oryzivora*, *Oxyrhynchus flammeiceps*, *Ictera militaris*, *Tijuca nigra*, *Malacoptila torquata*, and *Andigena bailloni*.

Many of the Sta. Catharina species not as yet obtained in Rio Grande do Sul may probably be found there still; but it seems quite possible that others (*Tanagra palmarum*, *Ceryle inda*, *Dacnis*, etc.) do not pass southwards of Sta. Catharina. I have never seen any *Dacnis* in the State of Rio Grande do Sul. The locality in the British Museum Catalogue, "Pelotas, Rio Grande do Sul (*Joyner*)," is wrong.

I now give a list of the species that occur between Rio Grande do Sul and Rio de Janeiro; and which, I believe, do not extend their distribution north of Rio. These are:—

<i>Euphonia pectoralis.</i>	<i>Sittosomus erithacus.</i>
<i>Hypophæa chalybea.</i>	<i>Dendrocolaptes picumnus.</i>
<i>Chlorophonia viridis.</i>	<i>Batara cinerea.</i>
<i>Tachyphonus coronatus.</i>	<i>Thamnophilus leachi.</i>
<i>Arremon semitorquatus.</i>	<i>Thamnophilus severus.</i>
<i>Aphobus chopi.</i>	<i>Leucochloris albicollis.</i>
<i>Cnipolegus nigerrimus.</i>	<i>Phaethornis eurynome.</i>
<i>Orchilus auricularis.</i>	<i>Clytolæma rubinea.</i>
<i>Alectrurus tricolor.</i>	<i>Rhumphastus dicolorus.</i>
<i>Mionectes rufiventris.</i>	<i>Pyrhura vittata.</i>
<i>Phyllomyias brevirostris.</i>	<i>Triclaria cyanogastra.</i>
<i>Phyllomyias burmeisteri.</i>	<i>Leucopternis palliata.</i>
<i>Sirystes sibilator.</i>	<i>Leucopternis lacernulata.</i>
<i>Phibalura flavirostris.</i>	<i>Penelope obscura.</i>
<i>Ampelion cucullatus.</i>	<i>Crypturus obsoletus.</i>
<i>Anabazenops rufo-superciliatus.</i>	

It thus seems that the fauna of Southern Brazil, from Rio de Janeiro to Rio Grande do Sul, has a great number of characteristic species and even genera. The latter are:—(a) *Culicivora*,

Hemitricus, *Heliobletus*, *Batara*, *Phibalura*, *Stephanophorus*, *Hypophæa*, *Orthogonys*, *Leucochloris*, and *Triclaria*; and (b) *Onipolegus*, *Cybernetes*, *Alectrurus*, *Cyanotis*, *Phlœocryptes*, *Anumbius*, and *Coryphospiza*.

The first group includes what are essentially South Brazilian genera; the second those of Argentina, which, advancing north, enter Southern Brazil. Many of the Argentine species occur in São Paulo at Itararé and Rio Verde only, on the boundary of the State of Paraná. To these it will be convenient to add some other species not yet observed in São Paulo, such as *Tænioptera dominicana* Vieill., *Piprites pileatus* (Temm.), *Leptasthenura striolata* Pelz., *Siptornis ruficilla* (Licht.), *Phacellodomus striaticollis* (Laf. & d'Orb.), and *Clibanornis dendrocolaptoides* (Pelz.).

It is a fact of zoo-geographical interest, that the boundary between São Paulo and Paraná corresponds to a faunistic line which is not transgressed by many birds characteristic of the Argentine Pampas.

Of special interest is the occurrence of *Cyanotis azaræ* and *Phlœocryptes melanops*—typical Patagonian birds which are likewise found in Chili, Rio Grande do Sul, and Bolivia. We have received from Iguape not only these birds but also their nests. These two birds accompany each other and occur in reedy swamps. It may be that they are resident at Iguape only in the summer; but it is also possible that they have been resident there since the time when the coast extended more to the east, and lowlands with marshes and lagoons occupied that part of the ocean which connects Rio Grande with Iguape.

We have many singular facts which tend to this conclusion. *Azara labiata* and *Paludestrina* are brackish-water species of mollusks, common from Iguape to Buenos Ayres; and again, *Chilina fluminea* and *Glabaris exotica*, of the fresh-waters of Iguape, are species characteristic of Rio Grande do Sul and Argentina, which are not found at all in the central and northern parts of the State of São Paulo (see my papers on the Geographical Distribution of the Freshwater Fauna of Southern Brazil). I cannot accept the explanations given by Dr. Ortmann, who says that the *Potamoniidae* do not coexist with the *Parastacidae* because of the effects of the struggle for life. In Rio Grande do Sul they do coexist, and I have observed that they cannot enter in competition, since they are quite different in their mode of life. The only satisfactory explanation is that based upon terrestrial modifications, as suggested above; and it seems to me that *Cyanotis* and *Phlœocryptes*, bad fliers as they are, must be considered, from the same point of view, as being relicts.

Cygnus melanocoryphus sometimes appears on the coast near Iguape. A curious fact is the appearance of a Penguin, *Spheniscus magellanicus*, on the coasts of Paraná and São Paulo. I am informed that last winter, during July and August 1898, thousands of dead Penguins were observed there. We have received

specimens from Iguape, Santos, and São Sebastião; but I see by the newspapers, that some have also been captured on the coast of Espiritu Santo. I observed this Penguin on the coast of Rio Grande do Sul in 1883. The extension of its winter excursions to the coast of São Paulo dates back only three or four years.

The northern element of the São Paulo Avifauna is very large, and has been considerably increased by my investigations.

From the littoral zone especially, *i. e.* Iguape, we have obtained examples of a number of common Bahia birds, not hitherto known to occur in São Paulo. These are such species as *Donacobius atricapillus*, *Dacnis speciosa*, *Tanagra palmarum*, *Thryophilus longior*, *Rhamphocelus brasilius*, *Sycalis flaveola*, *Elainea pagana*, *Lathria virussa*, *Dendrocicla turdina*, *Formicivora rufatra*, *F. ferruginea*, *F. squamata*, *Rhamphocenus melanurus*, *Formicarius colma*, *Merulaxis rhinolophus*, *Agyrtria tephrocephala*, *Pyrhura leucotis*, *Urochroma wiedi*, *Canceroma cochlearia*, and *Guara rubra*.

As genera of this northern element which are not found southward of the State of São Paulo, we may name:—*Thryophilus*, *Donacobius*, *Rhamphocelus*, *Capsiempis*, *Legatus*, *Myiozetetes*, *Rhynchocyclus*, *Conopias*, *Megarhynchus*, *Muscivora*, *Myiochanes*, *Ptilochloris*, *Chromocheris*, *Neopelma*, *Hadrostomus*, *Attila*, *Philydor*, *Biatus*, *Corythopsis*, *Lathria*, *Dendrocicla*, *Rhamphocenus*, *Formicarius*, *Merulaxis*, *Florisuga*, *Nonnula*, *Jacamaralcyon*, *Bucco*, *Urochroma*, *Busarellus*, *Buteogallus*, *Thrasaëtus*, *Leptodon*, *Anhinga*, *Scardafella*, *Crax*, *Porzana*, *Porphyriola*, *Palamedea*, *Canceroma*, and *Guara*.

To these may possibly be added *Lipaugus simplex* and *Pipra leucocilla*, mentioned from São Paulo without exact localities by Joyner, but not met with by other observers.

It may be useful to add here the names of species observed by Euler at Cantagallo, in the State of Rio, which hitherto have not been observed in São Paulo, namely:—*Aticora tibialis* Cass. (perhaps an erroneous determination), *Chlorophanes spiza*, *Nemosia flavicollis*, *Thlypopsis sordida*, *Pitylus brasiliensis*, *Phonipara fuliginosa*, *Coryphospingus pileatus*, *Icterus tibialis*, *Alectrurus risorius*, *Euscarthmus limbatus*, *Phyllomyias griseicapilla*, *Pipra rubricapilla*, *Mache-ropterus regulus*, *Cotinga cincta*, *Calyptura cristata*, *Picolaptes squamatus*, *Thamnophili doliatus*, *palliatu*s, *torquatus*, and *ambiguus*, *Myrmotherula melanogaster* and *M. brevicauda*, *Terenua maculata*, *Myrmeciza loricata*, *Percnostola funebris*, *Conopophaga melanops*, *Glaucis hirsuta*, *Hylocharis cyanea*, *Pygmyornis pygmaeus*, *Prymnacantha langsdorffi*, *Chloronerypes brasiliensis*, *Dendrobates maculifrons*, *Chelidoptera tenebrosa brasiliensis*, *Neomorphus geoffroyi*, *Chrysolis farinosa*, *Asturina nitida*, *Morphnus guyanensis*, *Harpagus bidentatus*, *Fulco aurantius*, and *Crypturus pileatus*.

It is probable that some of these species may occur in the littoral zone of São Paulo also: but many of them are certainly absent there, as, for example, *Cotinga cincta* and *Pipra rubricilla*. *Trogon aurantius* of Rio and Northern Brazil is in São Paulo replaced by